

LDM-D series

LASER SCAN MICROMETER OPERATION MANUAL



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EN -- Please scan the QR code or visit the website for operation manual.

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CZ -- Pro návod prosím naskenujte QR kód nebo navštivte webovou stránku.

ES -- Por favor, escanee el código QR o visite la página web para ver el manual de instrucciones.

FR -- Veuillez scanner le QR Code ou visiter notre site web pour accéder aux manuels d'utilisation.

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MN-LDM-D SERIES-E

V2

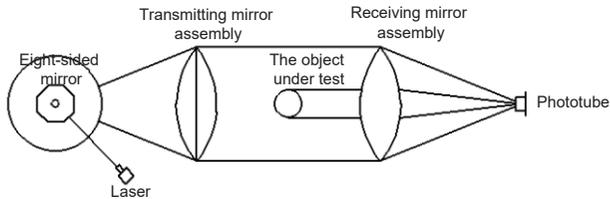
1 PRECAUTIONS



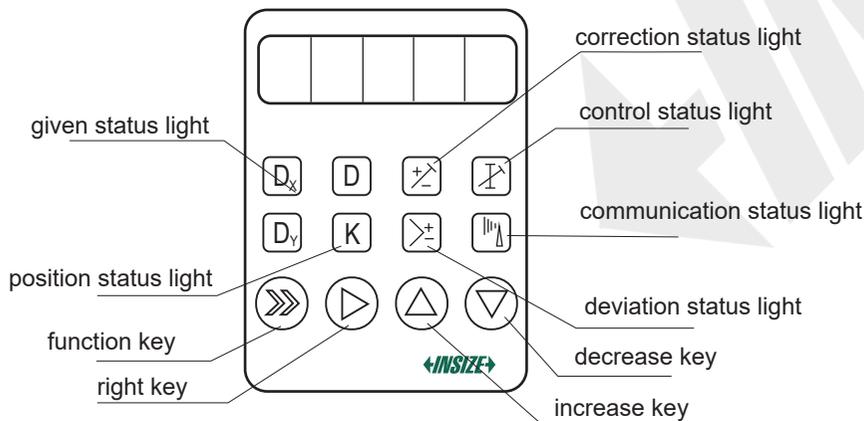
This product is classified as a Class 2 laser product. Please do not look directly at or observe the laser beam through optical instruments

2 WORKING PRINCIPLE

A laser beam is emitted by a semiconductor laser, which is driven by a motor to rotate a prism at high speed. The laser beam is scanned and converted into parallel light through the prism and passes through the test area. When there is an object under test in the test area, it will block part of the parallel light and convert it into a low level through the focusing prism on the photoelectric receiving tube. The parallel light that is not blocked by the object under test is converted to a high level. By calculating the scanning time of the low level, the outer diameter value of the object under test in the scanning direction of the laser beam can be calculated.



3 PRODUCT OVERVIEW



4 FUNCTION DESCRIPTION

Function Key

Press Function Key cyclically to enter the following states respectively: nominal value setting, upper and lower deviation setting (must be set when the alarm function is required), communication parameter setting, control parameter setting, deviation correction value setting, and printing parameter setting.

Right Key

After selecting the function to be set using Function Key , press to enter the parameter setting interface for that function. Then, press the Right Shift Key to select the digit that needs modification. Once the target digit is selected, it will flash, indicating that modification is allowed. After successfully modifying the digit, press again to stop all digits from flashing—only then will the modified value be stored in the instrument.

Increase Key and Decrease Key

After selecting the digit to be modified using Right Key , press either of these two keys to increase or decrease the value of the selected digit.

5 FUNCTION SETTINGS

5.1 Setting the Nominal Value

Press Key . When is steadily lit, it indicates that the nominal value of the cable diameter can be set.

Press Key again; the numbers on the five digits of the nixie tube will flash in sequence. Select the digit to be modified—when the number on this digit is flashing, press or to adjust the number to the desired value. Follow the nominal value of the cable diameter and complete the modification of all digits that need adjustment. When the value displayed on the nixie tube matches the nominal value, press continuously until the numbers on all digits stop flashing. This indicates that the nominal value has been set successfully and stored in the instrument.

Press Key to exit the nominal value setting mode.

Note: If any digit on the five-digit nixie tube is flashing and you press Key to exit, the nominal value of the diameter will not be set successfully. The nominal value stored in the instrument will remain the unmodified one.

If no other functions need to be set at this time, press Key continuously until all status lights are no longer steadily lit. This means the value displayed on the nixie tube is the current measured diameter of the test object.

5.2 Setting the Diameter Deviation Value

Press Key until it stays steadily lit. The nixie tube displays "H0.XXX" (X represents an editable digit; factory setting is H0.000), indicating that the upper deviation value of the cable diameter can be set.

Press Key . Refer to the upper deviation value of the cable diameter, select the digits to be modified in sequence, and press or to adjust the digits to the desired values. Press the key continuously until the values on all digits stop flashing. This indicates that the upper deviation value has been set successfully and stored in the instrument.

Press Key . The nixie tube displays "L0.XXX" (X represents an editable digit; factory setting is L0.000), indicating that the lower deviation value of the cable diameter can be set.

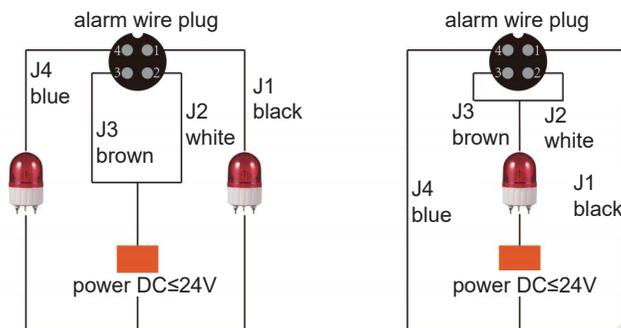
Press Key \odot and use \triangle or ∇ to modify the required digits in sequence according to the lower deviation value of the cable diameter, then store the successfully modified lower deviation value in the instrument.

Press Key \otimes to exit the diameter deviation value setting mode.

Note: If there is no need to set the upper deviation value and only the lower deviation value needs to be set, press Key \otimes until \square it stays steadily lit. When the nixie tube displays "H.XXXX", continue pressing Key \otimes , and the nixie tube will display "L.XXXX", indicating that the lower deviation value can be set.

After the nominal value and deviation values of the cable are set successfully, the instrument will have an over-tolerance alarm function. When the measured diameter of the cable exceeds the tolerance, the deviation status light \square will flash. If any of the parameters—actual measured value, nominal value, upper deviation value, or lower deviation value—is set to zero, the deviation status light will not flash in the measurement mode.

Schematic Diagram of External Alarm



- ◆ Alarm Output: when the measured value is below the lower tolerance limit, J1 and J2 are closed, and J3 and J4 are open. When the measured value exceeds the upper tolerance limit, J1 and J2 are open, and J3 and J4 are closed.
- ◆ Note: when separate alarm devices are connected for upper tolerance exceeding and lower tolerance exceeding respectively, Pin 1 and Pin 4 of the alarm socket form one group, and Pin 2 and Pin 3 form another group. When a single alarm device is shared for both upper tolerance exceeding and lower tolerance exceeding, short-circuit Pin 1 with Pin 4 and Pin 2 with Pin 3, and these form one group. The external connection method of the alarm device is as follows (see Figure 3 and Figure 4), Relay contact load: DC24V 1A

5.3 Communication Setup

1) Set Communication Parameters

To achieve normal communication with the diameter gauge, the following parameters must be set correctly:

Address Setting: The address range of the diameter gauge is 0–127.

Press the \otimes key continuously until the communication status light \square stays on; the digital display will show "DPC--".

Press the \odot key to enter the communication function menu password verification. Select the digit to be modified in sequence, and adjust the digital display value to the password "05628".

Press the \otimes key; the digital display will show "dPCA-", indicating that the address code can be set.

Press the \odot key; the number on the digital display will start flashing. Adjust the digital display value according to the desired address parameter (only the last three digits need to be modified, ranging from 0 to 127). After modifying the address parameter, press the \odot key continuously until the values on all digits stop flashing—this indicates the address parameter has been saved successfully.

Press the \otimes key; the digital display will show "dPCb-", indicating that the baud rate can be set.

2) Set Baud Rate

The diameter gauge provides five baud rate options for users: 2400bps, 4800bps, 9600bps, 19200bps, and 38400bps.

Press the \odot key; the 5th digit on the digital display will start flashing. Press the \triangle or ∇ key, the digital display will cycle through the five specified baud rates. Select the required baud rate, then press the \odot key continuously until all digits stop flashing—this indicates the parameter has been saved.

Press the \otimes key; the digital display will show "dPCC-", proceeding to the next step: setting the data transmission mode.

3) Set Data Transmission Mode

Data bits: 8 bits, Parity bits: Three options (odd parity, even parity, no parity)

Press the \odot key; the numbers on the digital display will start flashing. Only the 3rd and 4th digits need to be set to "0" or "1". The meanings of the "0" or "1" settings for these two digits are as follows:

2nd digital tube: 1 = When the upper computer has a parity bit.

3rd digital tube: 0 = Odd parity; 1 = Even parity.

4th digital tube: 0 = 8 data bits (no parity bit); 1 = 8 data bits (including parity bit).

After completion, press the \odot key to save the settings in the instrument. Press the \otimes key to exit the communication parameter setting mode. Press the \otimes key continuously until all status lights stop staying on—this indicates the value displayed on the digital tube is the current diameter measurement value of the measured object.

6 COMMUNICATION PROTOCOL

1. ASCII Code Communication (Custom Protocol)

The LDM-D series instruments adopt the slave mode for communication. External devices identify the instrument through the address code, and the transmitted data uses the ASCII code format.

The command code format for the host or external device to access the instrument is: Address Code + Command Code + End Code

The command codes are shown in the following table. The end code is 0X0D in hexadecimal and 13 in decimal.

decimal	ASCII code	hexadecimal	reading parameter definition
65	"A"	0X41	reading the X-axis measurement value
66	"B"	0X42	reading the Y-axis measurement value
67	"C"	0X43	reading the nominal value
68	"D"	0X44	reading the upper deviation value
69	"E"	0X45	reading the lower deviation value

After the instrument receives the host command, the format of the returned data code is as follows:

The received string consists of 9 data elements in total: Command Code + Slave Status Code + 5-digit Data Code (ASCII code, with the high-order data first and low-order data last) + Checksum + "E" (ASCII character "E", which is 0X45 in hexadecimal and 69 in decimal).

Slave Checksum = (Command Code + Slave Status Code + 5-digit ASCII Data Code) AND 0X7F (The meaning of the command identifier is the same as above).

The Slave Status Code reflects the current status of the slave device (lower-level device). If the slave device is in a normal measurement state, the Slave Status Code is 0X30 (hexadecimal), "0" (ASCII code), and 48 (decimal). Otherwise, the slave device may have a fault, and the current measurement value may be abnormal.

The command codes for the PC (or other upper-level devices) to write to the slave device (instrument) are as follows:

decimal	ASCII code	hexadecimal	reading parameter definition
97	"a"	0X61	write the nominal value
98	"b"	0X62	write the upper deviation
99	"c"	0X63	write the lower deviation
101	"d"	0X66	write the X-direction nominal value (for both directions)
102	"e"	0X67	write the Y-direction nominal value (for both directions)

The format for writing to the slave device (lower-level device) is as follows: It consists of 9 data elements in total: Address Code + Command Code + 5-digit Data Code (ASCII code, with high-order data first and low-order data last) + Checksum + "0X0D".

Slave Checksum = (Address Code + Command Code + 5-digit ASCII Data Code) AND 0X7F (The meaning of the command identifier is the same as above).

When the upper-level device writes to the slave device correctly, the return code from the slave device (instrument) is the ASCII code "OK", which is "4F, 4B" in hexadecimal.

2. MODBUS Communication Protocol (RTU Format)

Settings for communication using MODBUS protocol: (to be set on the micrometer)

Press the Ⓜ key continuously until the control status light  stays on; the digital display will show "DPI--", indicating entry into the control parameter menu for password verification.

Press the Ⓜ key to select the digits to be modified in sequence, and change the digital display value to the password "05689".

Press the Ⓜ key; the digital display will show "dP1-4", indicating that the MODBUS data reading function code can be set.

Press the Ⓜ key to enter the setting interface and set the parameter to "00003". Press the Ⓜ key continuously; the digital display will show "dP1-8", indicating that the MODBUS data writing function code can be set.

Press the Ⓜ key to enter the setting interface and set the parameter to "00016".

1) PLC Data Reading Mode

a. PLC transmission format:

Address code + Function code + ADDH + ADDL + NUMH + NUML + CRCL, CRCH (checksum)

- ◆ The function code is the parameter (in hexadecimal) for the "PID-4" prompt, the same below,
- ◆ ADDH and ADDL are the offset of the internal buffer of the instrument to be read, with the high-order byte first and the low-order byte second (the same below), occupying two bytes;
- ◆ NUMH and NUML are the number of data to be read, occupying two bytes;
- ◆ CRCL and CRCH are the CRC error-checking checksum, occupying two bytes, with the low-order byte first and the high-order byte second.

The above PLC reads the internal data of the instrument via MODBUS, and a total of 8 bytes of data need to be sent.

b. Instrument return data format: (Number of data ≤ 255)

Address + Function code + Number of data (N) + Data 1 + Data 2 + ... + Data N + CRC checksum

2) PLC Data Writing Mode

a. PLC transmission format:

Address code + Function code + ADDH + ADDL + NUMH + NUML + DATA + DATA1 + DATA2 + ... + DATAN + CRCL, CRCH (checksum)

- ◆ The function code is the parameter (in hexadecimal) for the "PID-8" prompt, the same below,
- ◆ ADDH and ADDL are the offset of the internal buffer of the instrument, with the high-order byte first and the low-order byte second (the same below), occupying two bytes,
- ◆ NUMH and NUML are reserved bytes, occupying two bytes,
- ◆ DATA is the number of data to be written,
- ◆ DATA1, DATA2 ... DATAN are the data to be written,
- ◆ CRCL and CRCH are the CRC error-checking checksum, occupying two bytes, with the low-order byte first and the high-order byte second.

The above PLC writes data to the instrument via MODBUS, and a total of 9 + N bytes of data need to be sent.

b. Instrument return data format: (Number of data = 8)

Address code + Command code + ADDH + ADDL + NUMH + NUML + CRCL + CRCH

3) The storage addresses of internal data in the instrument (starting from address 1)

1	4	7
MEAXYHH,MEAXYH,MEAXYL	MEAXHH,MEAXH,MEAXL	MEAYHH,MEAYH,MEAYL
Average (3 bytes)	X measurement (3 bytes)	Y measurement (3 bytes)
10	13	16
SETXYHH,SETXYH,SETXYL	SETXHH,SETXH,SETXL	SETYHH,SETYH,SETYL
Average of nominal value (3 bytes)	X nominal value (3 bytes)	Y nominal value (3 bytes)
19	21	
UPDEFH, UPDEFL	DOWNDEFH,DOWNDEFL	
Upper deviation (2 bytes)	Lower deviation (2 bytes)	

7 ON-SITE DEVIATION CALIBRATION

When the instrument is performing online fixed-point measurement and there is a deviation between the measured value displayed by the instrument and the actual diameter of the measured wire, deviation correction is required to make the measured value displayed by the instrument consistent with the actual diameter of the measured wire.

Press the \odot key continuously until the status light \square stays on and the segment display shows the password input prompt "Pad--".

Press the \ominus key to enter the password verification for deviation correction. Select the digit to be modified in sequence and change the value displayed on the segment display to the password "22220".

Press the \odot key, and the segment display will show the factory setting "0.0000" or "-.0000", indicating that on-site deviation calibration can be performed.

Press the \ominus key to modify the deviation correction value displayed on the segment display.

When the measured value displayed by the instrument is greater than the actual diameter of the measured object, input the deviation value as a negative number into the instrument; when the measured value displayed by the instrument is smaller than the actual diameter of the measured object, input the deviation value as a positive number into the instrument.

After completing the on-site deviation calibration setting, press the \odot key until the values on all digits stop flashing, indicating that the deviation correction value has been successfully stored.

When the correction value parameter is not zero, the correction value status light \square will flash in the measurement state.

SPECIFICATION

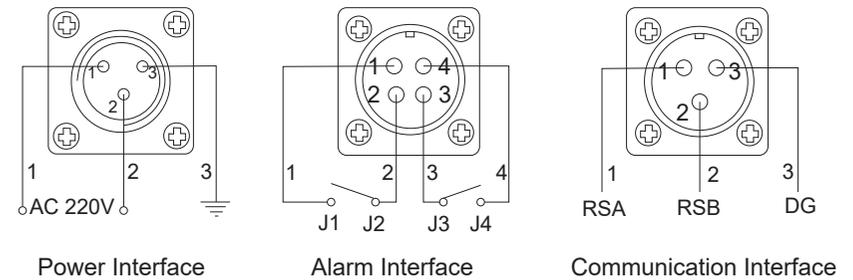
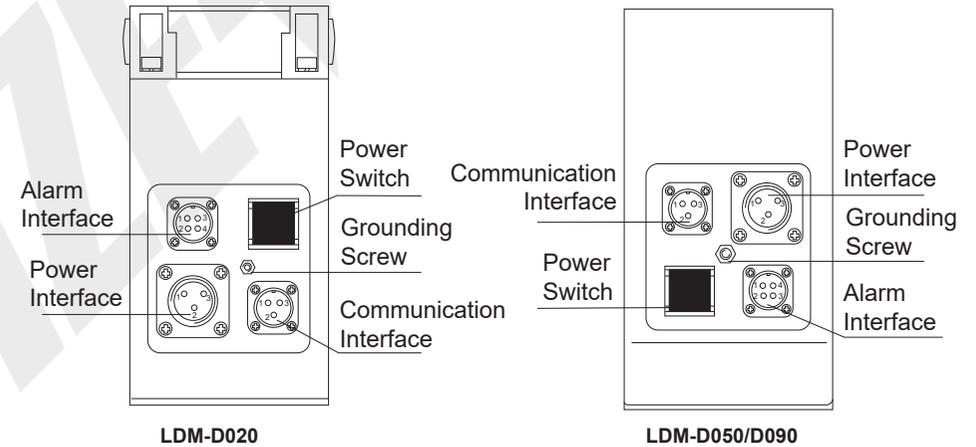
Code	LDM-D020	LDM-D050	LDM-D090
Measuring range	0.1~20mm	0.4~50mm	0.5~90mm
Accuracy (at 25°C)	$\pm (2+D^*/5)\mu\text{m}$	$\pm (3+D^*/5)\mu\text{m}$	$\pm (5+D^*/5)\mu\text{m}$
Repeatability (at 25°C)	$(1+D^*/5)\mu\text{m}$	$(2+D^*/5)\mu\text{m}$	$(3+D^*/5)\mu\text{m}$
Resolution	0.001mm		
Laser wave length	650nm		
Measuring speed	600 times/s		
Operation environment	5~45°C, $\leq 80\%$ without condensation		
Output	RS485		
Alarm output	24V, 1A		
Power supply	AC 100~220V, 50/60Hz		
Dimension (L×W×H)	298×72×167mm	400×76×164mm	600×80×185mm
Weight	3.8kg	5.1kg	8.7kg

* D is measuring diameter in mm

8 HARDWARE CONFIGURATION

LDM-D Series Laser Diameter Gauges adopt a non-contact measurement method and use a single-axis optical scanning system to obtain diameter data. They can be connected to the RS485 communication interface of a remote display or computer through the 3-core communication interface on the product to realize data communication and control, meeting end-users' needs for data processing and storage as well as enabling data traceability. The 4-core alarm socket on the product allows connection of the diameter gauge to an external alarm via a 4-core alarm cable, which enables an over-tolerance alarm function during on-site measurement (the maximum supply voltage of the external alarm shall not exceed DC24V).

For the measuring head interface diagram, please refer to Attached Figure 2.



9 DISPLAY

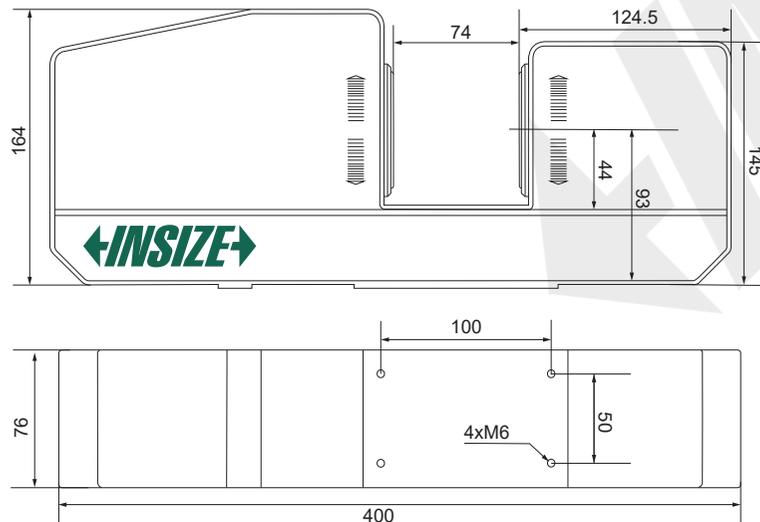
Normal Display

In the normal measurement state (when no nominal value and upper/lower deviation values are set), all status lights are not constantly on, and the segment display shows the measured diameter.

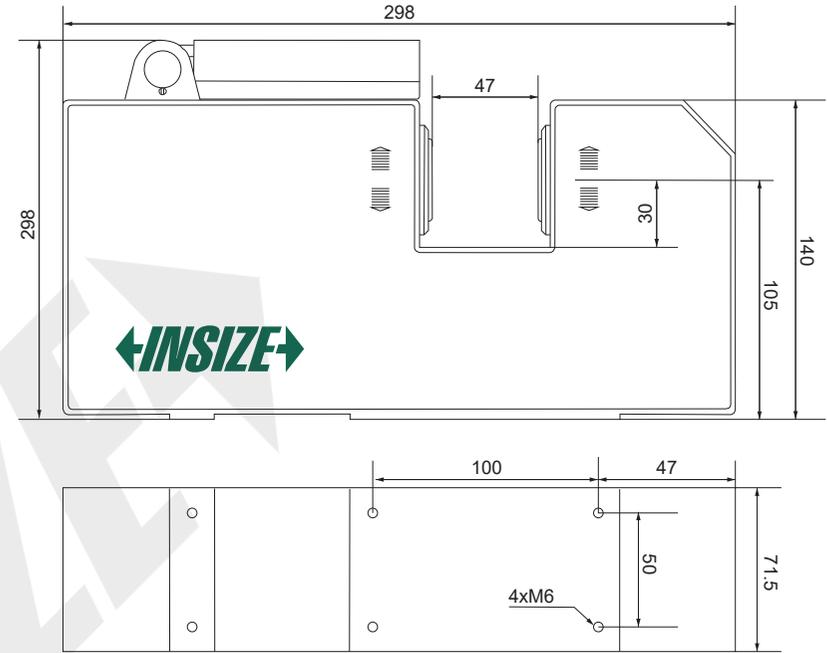
When the instrument's correction value parameter is not equal to 0, the correction status light will flash. When the cable outer diameter is out of tolerance, the deviation status light will flash; if the deviation status light does not flash, the cable diameter is within the deviation range.

Error Display

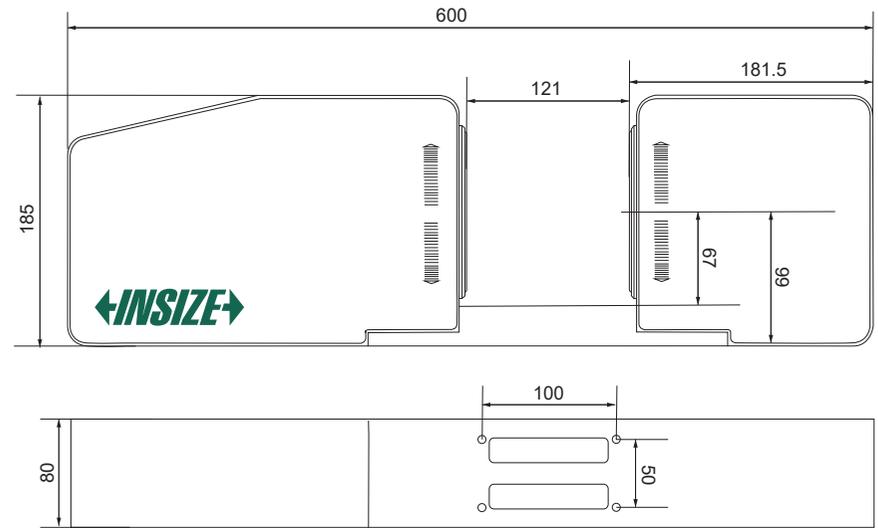
Fault phenomenon (segment display prompt)	Fault cause	Solution
PEr-1	1. The measured object is too thick, blocking the test area. 2. The laser is damaged. 3. The motor is damaged.	Check the normal testing range of the instrument Contact us
PEr-2	The measured object is at the edge of the measurement range	Check the normal testing range of the instrument
PEr-3	The measured object is at the edge of the measurement range, blocking part of the test area	Check the normal testing range of the instrument
PEr-4	There is dust on the test window	Wipe the window glass with lens paper
PEr-5	The main board is faulty	Contact us
PEr-6	The measured object is beyond the measurement range	Check the instrument model and verify the max. measurement range of the instrument
P----	The CPU on the main board stops working	Contact us



LDM-D050



LDM-D020



LDM-D090